CLAIMS

We claim:

1. A process for the catalytic partial oxidation of a hydrocarbon feedstock, comprising:

contacting a feed stream comprising a hydrocarbon feedstock and an oxygencontaining gas feed stream with a monolithic porous metal catalyst at conversionpromoting conditions effective to produce an effluent stream comprising carbon
monoxide and hydrogen.

wherein the atalyst comprises unsupported rhodium.

- 2. The process of claim 1 wherein the catalyst comprises a monolithic foam.
- 3. The process of claim 2 wherein the foam has 75-90% by volume pores and 20-100 pore size.
- 4. The process of claim 1 wherein the catalyst further comprises platinum.
- 5. The process of claim 1 wherein the catalyst is pretreated by exposure to air under conditions sufficient to oxidize the catalyst.
- 6. The process of claim 1, further comprising preheating said feed stream to a temperature of at least about 30°C.
- 7. The process of claim 6 wherein the feed stream is preheated to a temperature between about 50°C and about 700°C.
- 8. The process of claim 7 wherein the feed stream is preheated to about 400°C.
- 9. The process of claim 1 wherein maintaining the reaction zone further comprises maintaining pressure in said reaction zone between about 500 kPa and about 2800 kPa.



10. The process of claim 1 wherein the molar ratio of methane to oxygen is from about 1.5:1 to about 2.2:1.

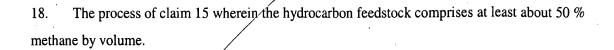
- 11. The process of claim 1 wherein the hydrocarbon feedstock comprises at least about 50% by volume of methane.
- 12. The process of claim 1 wherein the carbon selectivity for carbon monoxide is at least about 80 %.
- 13. The process of claim 1 wherein the hydrogen selectivity is at least about 60%.
- 14. The process of claim 1 wherein contacting the feed stream with the catalyst passing the feed stream over the catalyst at a space velocity from about 150,000 to about 10,000,000 NL/kg/h.
- 15. A process for the catalytic partial oxidation of a hydrocarbon feedstock, comprising:

contacting a feed stream comprising a hydrocarbon feedstock and an oxygencontaining gas feed stream with a monolithic porous metal catalyst at conversionpromoting conditions effective to produce an effluent stream comprising carbon monoxide and hydrogen;

wherein the catalyst comprises unsupported rhodium, the carbon selectivity for carbon monoxide is at least about 80 %, and the selectivity for hydrogen is at least about 60%.

- 16. The process of claim 15 wherein the catalyst comprises a monolithic foam.
- 17. The process of claim 16 wherein the foam has 75-90% by volume pores and 20-100 ppi pore size.

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- 19. The process of claim 15 wherein the catalyst further comprises platinum.
- 20. The process of claim 15 wherein the catalyst is pretreated by exposure to air under conditions sufficient to oxidize the catalyst.
- 21. The process of claim 15, further comprising preheating said feed stream to a temperature of at least about 30°C.
- 22. The process of claim 21 wherein the feed stream is preheated to a temperature between about 50°C and about 700°C.
- 23. The process of claim 22 wherein the feed stream is preheated to about 400°C.
- 24. The process of claim 15 wherein said contacting is carried out at a pressure between about 500 kPa and about 2800 kPa.
- 25. The process of claim 15 wherein the hydrocarbon feedstock contains methane and the molar ratio of methane to oxygen is from about 1.5:1 to about 2.2:1.
- 26. The process of claim 15 wherein the hydrocarbon feedstock comprises at least about 50% by volume of methane.
- 27. The process of claim 15 wherein contacting the feed stream with the catalyst comprises passing the feed stream over the catalyst at a space velocity from about 150,000 to about 10,000,000 NL/kg/h.
- 28. A process for the catalytic partial oxidation of a hydrocarbon feedstock, comprising:

- (a) preheating a feed stream comprising a hydrocarbon feedstock and oxygen gas to at least about 350°C;
- (b) passing the feed stream over an unsupported rhodium foam catalyst, at a space velocity from about 150,000 to about 10,000,000 NL/kg/h at conversion-promoting conditions comprising a pressure from about 500 kPa to about 2800 kPa wherein the conditions are effective to produce an effluent stream comprising carbon monoxide and hydrogen;

wherein the carbon selectivity for carbon monoxide is at least about 80% and the hydrogen selectivity is at least about 60%.

- 29. The process of claim 28 wherein the catalyst comprises a monolithic foam.
- 30. The process of claim 29 wherein the foam has 75-90% by volume pores and 20-100 ppi pore size.
- 31. The process of claim 28/wherein the hydrocarbon feedstock comprises at least about 50 % methane by volume.
- 32. The process of claim 28, further including pretreating the catalyst by exposure to air under conditions sufficient to oxidize the catalyst.
- 33. The process of claim 28 wherein the feed stream is preheated to about 400°C.
- 34. The process of claim 28 wherein the hydrocarbon feedstock contains methane and the molar ratio of methane to oxygen is from about 1.5:1 to about 2.2:1.
- 35. A catalyst for the partial oxidation of a hydrocarbon feedstock, comprising a porous rhodium form catalyst;

wherein the catalyst is adapted to oxidize the hydrocarbon feedstock with a hydrogen selectivity of at least about 60 %.

- 36. The catalyst of claim 35 wherein the foam comprises a monolithic foam.
- 37. The catalyst of claim 35 wherein the foam has 75-90% by volume pores and 20-100 ppi pore size.
- 38. The catalyst of claim 35 wherein the foam has been pretreated by exposure to air under conditions sufficient to oxidize the rhodium.